PART I

Chapter 1.1 EXECUTIVE SUMMARY

The 2000 305(b) Water Quality Assessment Report describes the water quality conditions in the Commonwealth of Virginia during the time period beginning January 1, 1994 through December 31, 1998. The primary purpose of this report is to satisfy the water quality reporting requirements of the Department of Environmental Quality under Sections 305(b), 106, 314 and 319 of the Federal Clean Water Act and the Virginia Water Quality Monitoring, Information and Restoration Act.

Virginia has nine major river basins with an estimated 49,460 miles of perennial rivers and streams and approximately 2,500 square miles of estuaries.

The overall water quality for Virginia is assessed based on the ability of the citizens to safely enjoy the designated uses of the waters as described in the Virginia Water Quality Standards. Table 1.1-1 briefly describes the designated uses and the baseline criteria used in this assessment to demonstrate support of the designated uses.

Table 1.1-1 DESIGNATED USE MATRIX

NO.	DESIGNATED USE	SUPPORT OF USE DEMONSTRATED BY
1	Aquatic Life Use	Conventional Pollutants (Dissolved Oxygen, pH, Temp.); Toxic contaminants in water column; Toxic contaminants found in sediments exceeding NOAA's Effects Range -Median Value; Biological evaluation.
2	Fish Consumption Use	Advisories, limiting consumption, and restrictions issued by the Virginia Department of Health; Toxic contaminants found in fish tissue exceeding DEQ screening value.
3	Shellfish Consumption Use	Restrictive actions for harvesting and marketing of shellfish resources made by Div. of Shellfish Sanitation of VDH.
4	Swimming Use	Conventional Pollutant (Fecal Coliform Bacteria) and/or beach closures issued by VDH
5	Public Water Supply Use	Closures or advisories by VDH.

Types of Data Used in Assessment

The assessment of surface waters and their ability to support the designated use(s) are based on two different categories of water quality information: **monitored data** and **evaluated data**.

Monitored data comes primarily from monitoring station samples DEQ has collected, analyzed and stored in either the Environmental Protection Agency's STORET database or DEQ's CEDS database. This data includes the analysis of conventional and toxic water column samples, sediment samples, fish tissue samples and biological assays.

The number of DEQ ambient monitoring stations providing sampling data during the five-year period was approximately 1,400 stations. Approximately 1,400 additional stations, from other

federal, state and/or citizen monitoring programs, were also assessed during this reporting period.

In previous years, most monitoring stations in Virginia were established to document known or suspected water quality problems or "targeted" monitoring for point source discharges. The result of this station siting method was to focus the assessment on known or highly suspected water quality problem areas. DEQ has become increasingly aware of potential nonpoint source water quality contamination and has moved some point source targeted stations to include random stations in seemingly non-impacted areas. Also, DEQ has increased the use of other “quality assured” data provided by several, federal, state and local organizations.

The intent of this change in monitoring strategy is to increase spatial coverage and to produce a more accurate and balanced portrayal of the state's overall water quality conditions. This approach also allows for a better understanding of the impacts associated with various point and nonpoint sources of pollution.

Where monitoring data are not available, **evaluated data** is used, wherever possible, to assess the attainment of the individual uses found in the water quality standards. These evaluations can be based on data associated with land use, point source discharges, nonpoint source pollution potential, fishery information, staff knowledge, and/or any other relevant water quality information.

In addition to increasing the spatial coverage of the monitoring station network, the agency is also conducting a much more detailed accounting of actual monitored miles associated with each station. For the 2000 assessment DEQ used EPA’s newly revised database which provides for a more accurate accounting between monitored miles versus evaluated miles. In past 305(b) reports the database that was used forced an entire waterbody to be considered monitored if any monitoring occurred within the waterbody. In many cases, only a small fraction of the waterbody was actually monitored, whereas other parts of the waterbody may have only been assessed using evaluated data. This approach inflated the reporting of monitored mileage in past reports. The new, improved EPA database allows each segment within a waterbody to be individually listed as evaluated or monitored. Therefore, if a small segment within the waterbody was actually monitored, it can be designated as such and the remainder of the waterbody would be reported as a distinct segment and listed as evaluated.

Assessment Methods Used In This Report

The overall goal of the assessment program is to properly identify problem waters and then to design and implement a water quality management plan to return these waters to their designated uses.

The assessment approach used in this report begins by comparing monitoring data against the regulatory standard for each parameter. Based upon that comparison, the water segment is placed in one of four assessment categories based upon the degree of support of the designated uses for that water:

- Fully Supporting
- Fully Supporting but Threatened
- Partially Supporting
- Not Supporting

In order to properly assess water quality data a statistical approach needs to be used. There are several reasons for this.

1. Because environmental conditions vary, it is possible that monitoring data may violate a water quality standard without signaling a significant environmental problem causing the loss of designated uses. Consequently, while some

measurements might violate water quality standards, a low violation rate is an insufficient reason to classify a stream as failing its designated use. The assessment challenge is to interpret the limited amount of sample data available to determine whether an apparent violation of standards warrants classifying a segment as not fully supporting its designated uses. The water quality samples taken are affected by variability in human activity and natural or background conditions.

2. There are certain acceptable tolerances for violations. For example, an occasional violation of a dissolved oxygen standard, even if caused by human activity, may not be critical to the aquatic environment.

3. Measurement errors in the analysis of the samples collected could be yet another reason why the numeric standard might be violated in a sample.

In developing this report DEQ used two statistical assessment methods: the EPA Percent Method and the Binomial Assessment Method.

The EPA Percent Method

National guidance issued by EPA recommends that states use an assessment method for the 305(b) report based on assumptions about the kind and frequency of data needed to support such an assessment. The object is to indicate whether waters are fully, partially, or non-supporting for the designated uses. EPA has proposed two thresholds for this purpose for conventional pollutants: a 11% violation rate places the waters into the partially supporting category and a 25% violation rate places the waters into the not supporting category. These percentages are fixed.

For the 303(d) list of Impaired Waters, the guidelines require a water to be listed as impaired (i.e., if it is classified as either partially supporting or not supporting) only if more than 10% of the samples violate the standard. In effect, the EPA assessment guidelines imply that a violation of the numeric criterion is acceptable in 10% of the samples taken.

The Binomial Assessment Method

In 1997, the Virginia General Assembly adopted the Water Quality Monitoring, Information and Restoration Act which directs DEQ to develop the 305(b) and 303(d) reports "in consultation with state universities." The Virginia Water Resources Research Center coordinates a group of scientists and engineers from several state universities to advise DEQ. This group is called the Water Quality Academic Advisory Committee. The Committee reviews issues and provides input to DEQ on assessment, monitoring, and standards issues. The Committee has also reviewed the binomial and other statistical methods to use in conducting assessments of water quality data. The binomial method is a sound statistical procedure that is a more sophisticated statistical approach than the EPA Percent Method. The binomial method recognizes the possibility of making data interpretation errors and allows for explicit control over the kind of error that might be made.

The binomial method statistically analyzes violations in light of two possible group violation rates, 11% and 25%. The chance is computed for the likelihood of a sample coming from a group with the specified violation rate. If the sample is statistically likely to have a violation rate of 10% or less, the waters from which the sample is taken are considered suitable for the use. If the sample is statistically likely to have come from a group with a violation rate between 11% and 25%, the waters are classified partially suitable for the use. Finally, if the sample is likely to have come from a group with a violation rate in excess of 25%, the waters are considered to not meet the use.

Although EPA guidance calls upon states to use the Percent Method, DEQ believes that the Binomial Method is a superior approach for assessing water quality data. DEQ continues to work with EPA to secure approval for use of the Binomial Method. Since that approval had not been received at the time of the publication of this report, DEQ used both methods to present a comparison between the two. The results of the assessment are recorded in the Virginia Assessment Database that is forwarded to EPA in accordance with federal regulations.

Results – Rivers and Streams

This report presents the results of the assessment of monitored water quality in approximately 9,200 miles (20.3%) of the total 49,350 miles of free-flowing streams and rivers and the remaining being evaluated.

Of the river miles assessed using monitored data, the following table presents the results from the two assessment methods used in the 2000 assessment:

ASSESSMENT RESULTS FOR RIVERS AND STREAMS				
Degree of Use Support	EPA Percent Method		Binomial Method	
	(miles)	(%)	(miles)	(%)
Fully Support All Assessed Uses	4,088	44.5	4,184	45.6
Fully Support All Assessed Uses but Threatened for at Least One Use	636	6.9	1,221	13.3
Do not Fully Support One or More Uses	4,466	48.6	3,770	41.1

As in previous reports, the "fully supporting but threatened" category has been used. This category is used to describe a particular designated use that fully supports that use now but, based on evaluated or other related data, especially those associated with nonpoint source impacts, may not in the future. As part of the ongoing assessment process, these threatened waters will assist the monitoring program in station siting and better, more conclusive, assessment data should be produced for future assessments.

The leading cause of nonsupport or partial support of designated uses in Virginia's rivers and streams is violation of the fecal coliform bacteria standards. Agricultural practices appear to be one of the primary sources contributing to the bacteria standards violations. However, urban runoff, leaking sanitary sewers, failing septic tanks, and wildlife are also significant contributing sources.

Results – Tidal Estuaries

This report presents the results of the assessment of monitored water quality in approximately 2,000 square miles (80 %) of the total 2,500 square miles of tidal estuaries and the remaining being evaluated.

Of the area (in square miles) of tidal estuaries assessed using monitored data, the following table presents the results from the two assessment methods used in the 2000 assessment:

ASSESSMENT RESULTS FOR TIDAL ESTUARIES				
Degree of Use Support	EPA Percent Method		Binomial Method	
	(sq. miles)	(%)	(sq. miles)	(%)
Fully Support All Assessed Uses	773	38.8	775	38.9

Fully Support All Assessed Uses but Threatened for at Least One Use	796	40.0	795	40.0
Do not Fully Support One or More Uses	422	21.2	420	21.1

The leading cause of impairment in Virginia's estuarine waters is violation of the General Standard for healthy benthic (or bottom dwelling) organisms due to low dissolved oxygen events. Another leading cause of impairment is violations of the fecal coliform bacteria standard associated with shellfish consumption advisories.

Based on limited available information, all of Virginia's 120 miles of the Atlantic Ocean Coastal Waters were evaluated as fully supporting Virginia's designated uses.

Results – Lakes and Reservoirs

Virginia has 104 significant (public water supply and/or > 100 acres), publicly owned lakes and reservoirs with an estimated 149,982 total acres. Of these, 116,669 (77.8%) monitored acres were assessed during the reporting period.

Of the area (in acres) of lakes assessed using monitored data, the following table presents the results from the two assessment methods used in the 2000 assessment:

ASSESSMENT RESULTS FOR LAKES AND RESERVOIRS				
Degree of Use Support	EPA Percent Method		Binomial Method	
	(acres)	(%)	(acres)	(%)
Fully Support All Assessed Uses	25,265	21.7	28,696	24.6
Fully Support All Assessed Uses but Threatened for at Least One Use	87,524	75.0	86,029	73.7
Do not Fully Support One or More Uses	3,880	3.3	1,944	1.7

The majority of these waters were not fully supporting for aquatic life use, primarily due to stratification in the lakes causing dissolved oxygen depletion.

DEQ is testing a pilot program to thoroughly monitor a percentage of the significant lakes in each region on a rotating basis and based on a prioritization matrix that DEQ developed. Results of this pilot program will be included in the next reporting period.